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THE ECOLOGY AND BEHAVIOR OF TWO SYMPATRIC *LYGODACTYLUS* GECKOS

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During a two-month field study (23 June-25 August 1965) of the behavior and ecology of the reptiles and amphibians of south Turkana, Kenya, data were collected on the two closely related and ecologically similar *Lygodactylus* geckos (*L. picturatus keniensis* and *L. somalicus battersbyi*) which occur sympatrically in the area.

Both species are small as geckos go. Adult *L. picturatus keniensis* Parker range in snout-vent length from about 26-35 mm and are dark grayish brown above with longitudinal light and dark markings on the head and shoulders. Adult *L. somalicus battersbyi* Pasteur are smaller, with snout-vent lengths of 21-27 mm, and are uniformly light gray to sandy beige on the dorsum. In the field it was virtually impossible to tell the sexes of either species apart solely on the basis of color pattern.

Both species, *L. picturatus keniensis* Parker and *L. somalicus battersbyi* Pasteur, are diurnal as are all the other species in the genus, although the ophthalmological evidence indicates that the group has reacquired diurnal habits from a nocturnal ancestry (Underwood, 1954:470).

As most geckos are primarily nocturnal, it is not surprising that the information which does exist on gecko behavior deals largely with the more easily observed diurnal species. Kästle's (1964) terrarium studies of *Lygodactylus p. picturatus* and three species of diurnal *Phelsuma* are among the most comprehensive available for geckos. His comparisons between these two groups of diurnal geckos should be a stimulus for obtaining more information by which the comparisons may be extended to other diurnal (e.g., *Gonatodes* and *Sphaerodactylus*) and nocturnal species.

Distribution: Lygodactylus is an African-Malagasy genus in both origin and distribution. *L. picturatus*[1] is widely distributed throughout east and central Africa and is the most widespread of the 13+

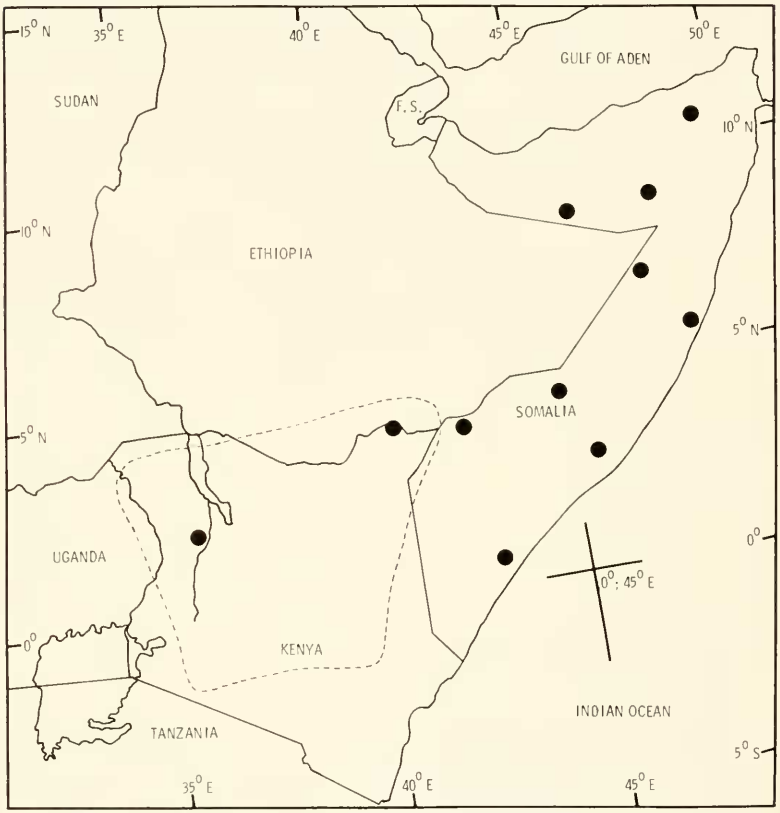

Figure 1. Map showing the distribution of *Lygodactylus picturatus keniensis* (area bounded by the dashed line), and localities outlining the distribution of *L. somalicus* (black dots). The westernmost locality for *L. somalicus* corresponds to the study area where the data for the paper were collected. *L. picturatus* (subspp.) occurs throughout the area shown in the map, except on the Arabian Peninsula. The distribution of *L. p. keniensis* is adapted from Pasteur (1964:77, fig. 20). The abbreviation F.S. stands for French Somaliland.

[1] I follow Loveridge's (1947) and Pasteur's (1960) taxonomic treatment of the genus. By simply calling *L. picturatus* a superspecies and raising subspecies to species rank, Pasteur (1964) has not substantially improved our understanding of the situation.

species in the genus found on continental Africa. *L. p. keniensis* is a subspecies occurring in the northern two-thirds of Kenya and the bordering edges of the neighboring countries. *L. somalicus* is an endemic of the arid Somali region. *L. s. battersbyi* ranges from the vicinity of the Somaliland-Ethiopian border south into northern Kenya (Fig. 1).

Turkana is a district in the extreme northwestern corner of Kenya, lying between Lake Rudolf on the east and the Uganda-Kenya border on the west. Both geographically and ecologically the area is a western outlier of the arid Somali region to the east (Schmidt, 1923; Parker, 1932, 1936, 1942).

As various parts of Turkana have been described in some detail elsewhere (von Höhnel, 1894; Worthington, 1932; Fuchs, 1935, 1939; Buxton, 1937), no more than a brief description of the area need be given here.

South Turkana, where these observations were made (Figs. 2-3), is extremely arid and consists of numerous rugged plateaus and broken hills. Between these extend vast lava and quartzite pebble sheets and barren windswept sand flats. Goats and drought have kept vegetation to a minimum except along the larger water courses, which never carry a permanent supply of water. *Acacia* is by far the most predominant plant group, and it is in the *Acacia* trees that one finds the *Lygodactylus* geckos.

The local distribution of the two species in south Turkana was a bit peculiar. Both species were quite common in the study area except along the Kerio River at Lokori (Fig. 3). This area was visited several times during the course of my two-month stay, but only three or four individuals of each species were ever seen. This scarcity was not too unusual in the case of *L. s. battersbyi* as it was always found less frequently in the large *Acacia tortilis* which is dominant along the larger water courses such as the Kerio, Kakurio, and Kalabata. *L. p. keniensis*, however, was usually very common in these acacias, except along the Kerio — an exception that merits special consideration below (see Competition section).

Food: Movement of prey organisms seems to be a prerequisite for eliciting a gecko's attention. Food items of *L. p. keniensis*, as determined by field observations and an analysis of the contents of ten stomachs, included a wide variety of invertebrates ranging in size from Diptera less than three mm long to mantids as long as the snout-vent length of the gecko itself. Most food items, however, are small (5 mm or less in length).

Perhaps the most common arthropod in the geckos' microhabitat and yet one that is never considered as food is an ant species

of the genus *Crematogaster* (species near *paolii*) — large numbers of which occur on every *Acacia*. The ants of this genus are well known for their fetid secretions (W. L. Brown and E. O. Wilson, personal communication), which may account for their being generally avoided by geckos. However, the geckos often "ambush" columns of ants returning from a raid on a tree termite nest and pluck the largest morsel from the clutches of a particularly successful raider. At other times, the ants are actively avoided, and if, on being wounded and disabled, the gecko adheres to the tree, he is soon covered with the swarming ants.

The termites of the *Acacia* always cover their paths on the surface of the tree with thin, dirt arches. When one of these arches is accidentally broken open, the workers immediately begin to repair it. During this process, a worker must expose himself to some degree for a few seconds while at the breach, and there is rarely a breach without a gecko patiently partaking of the feast. There is usually intense competition for the single position at the breach and once the dominant animal is removed, his place is quickly taken.

Both species possess great visual acuity, individuals often being attracted by a movement of a small (1-2 cm) object 2-2½ meters distant.

Both species of geckos spent a good deal of time licking the extremely viscous, amber colored exudate of the *Acacia* trees, although the reasons for such actions are unknown. Like Kästle's (1964:489) *Phelsuma*, the *Lygodactylus* geckos under my observation also licked a variety of jams and jellies, apricot being their favorite flavor.

Water economy with these geckos, as with all reptiles of the area, must be of crucial importance. No dew was ever formed during the two months of field work, and we encountered rain only twice (1, 14 August); both times the amount was insufficient to cover the ground. One day a *L. s. battersbyi* was found licking the moisture from near the mouth of a canvas water bag that was customarily hung from the tree it inhabited. The gecko appeared practically oblivious to movement around him and continued his licking for approximately 15 minutes.

Activity temperatures and periods: Cloacal temperatures of three active *L. p. keniensis* taken during the morning were 32.9, 34.5 and 35.1°C. Air temperatures at the positions from which these geckos were taken were 30.8, 32.9 and 35.5°C, respectively. Cloacal temperatures for six geckos on the initial loss of the righting reflex ranged from 43.3-44.3°C. (average 43.7°C.).

During the preliminary stages of heat distress *L. p. keniensis* behaves in a manner characteristic of many lizards, i.e., the body is raised off the ground on straightened legs, the mouth is held open, and the respiration rate increases.

Both *L. p. keniensis* and *L. s. battersbyi* are most active during the morning and late afternoon. During the mid-day they usually remain stationary, sometimes remaining in the same spot for an hour or more. I rarely saw a *Lygodactylus* on the sunny side of a branch. They usually chose to move along the underside of branches although, if this side were exposed to the sunlight, they would move along the upper, shaded side.

Approximately 15 to 30 minutes after the sun has set, foraging individuals of *L. p. keniensis* suddenly begin to ascend the branches of their trees. Some seek out a cavity in which to pass the night, but the majority of them climb to the peripheral branches and, turning so as to face the quickest avenue of escape, settle down for the night. In the morning, about 15 to 30 minutes before sunrise, they suddenly "come to life" again and quickly scurry down the branches to the main part of the tree to begin the day's foraging. *L. s. battersbyi* was also seen ascending and descending the terminal branches at approximately the same time as *L. p. keniensis*, although no individual of this species was ever observed assuming his sleeping position.

These were by far the longest activity periods of any of the diurnal lizards in the area. The lacertids and agamids rarely appeared until about an hour and a half after sunrise and retired shortly before sunset. It thus seems as if the diurnal *Lygodactylus* geckos have retained enough of their family's nocturnal heritage to enjoy the best of both worlds.

External morphology: Before proceeding with a discussion of the behavior of the two species, it will be helpful to describe briefly some of the more important aspects of color pattern and external morphology (Table 1).

Hatchling *L. p. keniensis* are 13-14 mm in snout-vent length. The dorsum is grayish brown with whitish spots which are bordered with black along their anterior edges. These whitish spots extend onto the dorsal surface of the tail where they become wider than long but are still bordered on the anterior edge by black. The result is a generally mottled and cryptic appearance. The tail is brownish orange above and orange-red below. This bright ventral color extends forward along the midventral line to the pectoral region. The dark chevron markings of the throat are faintly evident.

The change to the adult pattern entails the loss of the bright color on the tail, the change from an orange stripe to a yellow one along the ventral midline, the development of roughly longitudinal light and dark markings on the head and shoulders, and an intensification of the black on the throat.

Adult males are usually slightly larger and stockier than females. The largest male of our specimens has a snout-vent length of 35 mm; that of the largest female is 34 mm. The black on the throat of the males also tends to be slightly more extensive than in females. The light and dark chevrons and white, O-shaped postmental spot, said to be characteristic of this subspecies (Loveridge, 1947: 198, 228), are lacking in some adults of both sexes that have almost solid black throats. In the majority of the specimens, however, the "typical" pattern can be seen.

Preanal pores and escutcheon scales appear in males at a snout-vent length of about 26-27 mm. There are usually 6-8 preanal pores arranged in an anteriorly projecting, obtuse chevron. The grayish escutcheon scales are distributed in four separate areas: the underside of the thighs, directly anterior to the preanal pores and between the preanal pores and vent. Females lack these secondary sexual characters.

Both sexes have a light yellow midventral stripe on the body bordered laterally by a light gray area which extends to the dark brown dorsal color of the sides. When the animal is cold, however, the pale midventral yellow becomes a very bright mustard yellow and the dark chocolate brown color of the dorsum extends ventrad to the edge of the bright yellow stripe.

Hatchling *L. s. battersbyi* are about 11.5 mm in snout-vent length. The dorsum is a cryptic light brown with scattered white and dark brown flecks. The tail is faintly tinged with reddish orange, and the entire venter is immaculate.

Adults show little or no sexual dichromatism. Both sexes are uniformly brown above with dark brown spots on each shoulder and a few less well-defined dark brown spots on the sides. The white flecking and reddish tinge to the tail of juveniles are lacking. There is a thin dark brown horizontal stripe through the eye onto the side of the head.

Adult females average slightly larger than adult males. The largest male and female in our sample each measures 27 mm.

The smallest male with preanal pores and escutcheon scales measures 21 mm in snout-vent length. There are usually 6 preanal pores (two specimens have 5 pores) arranged in an anteriorly projecting obtuse chevron. Only the undersides of the

thighs bear escutcheon scales. Females lack these secondary sexual characters.

Both *L. p. keniensis* and *L. s. battersbyi* have black pigment in the bones of the cranium and a jet black peritoneum. These characters have been tentatively associated with diurnal habits among geckos (Kluge, 1967), although experimental work attempting to elucidate the adaptive significance of this pigment distribution has been inconclusive (Hunsaker and Johnson, 1959).

Adults and hatchlings alike of both species have the tip of the tail very slightly spatulate and provided ventrally with a double row of lamellae. In general appearance this structure closely resembles the ventral surface of the expanded digital tip. The tip of a regenerative tail has the differentiated ventral "scansorial" scales of an original tail, but it lacks the ordered arrangement of a double row.

Loveridge (1947:195), Kästle (1964:487-488), Mertens (1964), and Pasteur (1964:12,76) discuss this structure on the underside of the tip of the tail in terms of its "adhesive" or "holding" advantage for these arboreal lizards. Such a function is suggested by its gross similarity to the digital pads, the fact that resting animals often have only the extreme terminal end of the tail in contact with the substrate (see Kästle, 1964, fig. 2a) but move about with the subterminal area dragging on the substrate and the terminal area curved slightly upward, and the fact that dead animals have been seen hanging by the tail.

It is difficult to watch these two species of geckos actively foraging, especially during the late afternoon when they are most active, and not see another possible function of this terminal subcaudal expansion. During the times when an individual is very active, the tail is frequently raised in a deep arch and the tip of the tail is quickly touched to the substrate, withdrawn, and touched down again several times. In this manner the gecko quickly makes contact with parts of the surface behind him through almost 180°. In this action it seems as if the tail functions less as a grasping organ than as a tactile sensory organ. Such a tactile sensory function would, of course, be an added advantage in an arboreal life.

Display: From Kästle's (1964:494-495) description of the intraspecific display of *L. p. picturatus* it would appear that the display of *L. p. keniensis* is very similar. In "full display" an adult gecko simultaneously raises the body slightly on straightened legs, arches the back (exposing the yellow midventral stripe?), bows the neck with the snout pointing slightly down and distends the

black throat. The display may be given with the body in a head-on or broadside position relative to the individual eliciting the response. Often both body positions are assumed alternately or successively, with the displaying gecko moving closer to the antagonist in the head-on position. It is also in the head-on position that the head is sometimes quickly jerked from side to side through a small arc.

Among adults this display may be given by males to males in fighting, by males to females in courtship activities, by females to females in fighting, and by females to males in repulsing courtship overtures. Except in courtship, the displays never lasted more than a few seconds and in only two instances except for courtship did they lead to actual physical contact.

One of these cases was brought about by introducing a foreign male into a small scrub *Acacia* tree occupied by two adult females and a single male. The resident male approached the quiescent foreign male while displaying head-on and broadside until, after a close broadside display, he suddenly attacked the foreign male with such force that both geckos fell out of the tree. The resident male immediately regained his tree, but the introduced male made his way back to the tree slowly and stayed around the base for some time. Several days later, however, he was still in the same tree, but he always elicited displays from the original male whenever the two met.

The only component of the display commonly encountered separately was the distended black throat. This was often given in "mild distress" situations. Another, more common, means of aggression was a simple attack or rush at an individual. This behavior was seen in juveniles as well as adults, especially when there was a large size difference — in favor of the attacker.

During the 15 to 30 minutes after sunset that the geckos remained active, the intensity of the day's aggression between individuals declined or diminished altogether. In one instance in which two females and one male were occupying a single, small *Acacia* tree, the larger female had been chasing the smaller female and male from a favorite food supply at the base of the tree all during the afternoon. Shortly after sunset, however, and until they retired, all three adults were feeding within centimeters of each other at the site.

It is interesting to note that *L. s. battersbyi*, which is so different in color pattern from *L. p. keniensis*, displays in the same way, i.e., the body is slightly raised on straightened legs, the back arched,

the neck bowed with his head pointing downward, and the immaculate throat distended. The body may assume the head-on or broadside position alternately, and head jerking can be a part of the head-on approach.

Although both species display in the same manner and sometimes occur in the same tree, the display was never used interspecifically. Confrontations did occur, however, and they always resulted in the *L. s. battersbyi* simply being chased from the scene by a larger or more bulky *L. p. keniensis*.

The hatchlings and juveniles of both species were always completely ignored by the adults, although the adults often ate moving objects larger than the little geckos. The smaller individuals showed little fear of the adults, but they always moved aside when they found themselves in the path of an adult.

Foreign objects never elicited a display response from either species.

Courtship and mating: Courtship and mating were observed only once in *L. p. keniensis*, but the behavior was sufficiently different from Kästle's description (1964:497-498) to warrant a complete description based on my observations.

The pair was first seen about 12:35 PM on the dark vertical trunk of an *Acacia tortilis* along a large watercourse. The male was posturing in the typical display, slightly broadside to the female. She moved toward his flanks and nipped at the basal third of his tail. The male immediately completed the circle by coming around to her tail which she would then twitch back and forth across his face while moving away with him following. The courtship was interrupted several times at this point, but it was always initiated again by the female. After separating 70 to 100 cm, it appeared as if the female began searching for the male. She would approach his tail, and the male would stiffen slightly and give a few quick sideways jerks of the head. The female then nipped at his tail and he gave a full display. The female would again approach his tail, and the male, completing the circle, would come up behind her and follow closely behind as the female moved slowly away wagging her tail across his face.

Mating took place when the male continued creeping forward over the female after she had stopped, and grasped the female about the body approximately 2 mm posterior to the axilla with his forefeet. Holding the skin of the right side of the female's nape in his mouth, the male twisted his tail up and under hers from the right side, bringing their vents together with the male's tail on the female's left side. The left hind foot of the male was held on

the dorsal side of the female's left thigh at its base, and his right hind foot was on the tree trunk. After a firm union was obtained, the male dropped his forefeet from around the body of the female onto the surface of the tree. Mating lasted for about 40 minutes, after which time the female flicked her tail sideways several times and the male disengaged himself, arching his tail upward in a deep bow. Each individual proceeded to lick the area around his vent.

The cyclic turning of the female on the tail of the male and being turned upon by the male, the wagging of the tail in the face of the following male and the recurrent initiation of courtship activities by the female are elements in the courtship and mating of *L. p. keniensis* not observed by Kästle in his *L. p. picturatus*.

Males were seen to initiate courtship activity on several occasions, but were quickly repulsed by a display from the female.

Only a single mated pair of the more elusive *L. s. battersbyi* was observed. The pair was found about 10:30 AM in a shadow on the side of a scrub *Acacia*.

The male had grasped the skin of the right side of the female's nape in his jaws and had brought his vent next to hers from the left side. The male's back was slightly hunched and his tail trailed behind on the left side. The male's forefeet were employed in grasping the female around the pectoral region behind the shoulders and were not placed on the trunk. His right hind foot rested on the dorsal surface of her right thigh at its base, and his left foot was in contact with the trunk.

The female seemed to be made quite nervous by my presence. She wagged her tail from side to side, often touching the male's back. The female stayed at the same locus but frequently turned about 180°, always carrying the male with her and keeping the pair oriented along the longitudinal axis of the branch.

After breaking off copulation, the female quickly disappeared, but the male began licking his vent.

Reproduction: Both *L. p. keniensis* and *L. s. battersbyi* lay two white, hard-shelled eggs in cavities of the tree which they inhabit. Usually the termites have excavated cavities in one or more branches, and, when these are abandoned, they become favorite sites for egg deposition (Fig. 4). Eggs will be laid in a particularly favored spot year after year, the newest pair of eggs being deposited on top of the pile. In this way as many as 40 egg shells can accumulate in a single cavity.

L. s. battersbyi lays slightly smaller eggs than *L. p. keniensis* and the eggs of both species can be found in the same cavity.

Whole egg shells were frequently found with a small circular hole through the shell and the yolky contents completely removed. The most likely explanation for this loss is predation by the ants which invariably inhabit the *Acacia* trees.

Another possible predator of *Lygodactylus* eggs or young is *Homopholis fasciata,* a gecko which inhabits, almost exclusively, these same cavities in which the *Lygodactylus* species lay their eggs.

Developing eggs, hatchlings and gravid females of both species were encountered throughout July and August. The smallest females of *L. p. keniensis* and *L. s. battersbyi* with large, shelled oviducal eggs nearly ready for deposition measured 28 and 24½ mm, respectively, in snout to vent length (Table 1). In all females carrying two large oviducal eggs, the egg in the right oviduct was placed more anteriorly in the body cavity than the egg in the left oviduct.

Population structure: Almost any scrub *Acacia* over a meter in height was likely to have one or more *Lygodactylus* inhabiting it. In an attempt to get some idea of the population structure of the *L. p. keniensis* in these trees, several of them were held under observation and the adults collected as they came to light until it was felt that the entire adult complement had been collected. In one instance, a large *Acacia tortilis* was also "collected out." The results of such collecting (Table 2) showed that females outnumber males 2 to 1.

Whether the 2 to 1 sex ratio is a reflection of a disproportionate birth ratio or the result of heavy selection pressure on the males cannot be decided at present.

L. s. battersbyi is so secretive that it is impossible to satisfy oneself that the entire adult population of any one tree has been collected. The general impression, as indicated by the sex ratio of the specimens collected (18 males, 26 females), is that females may also outnumber males.

On the open expanses, where the scrub *Acacia* predominates, the population inhabiting a single tree usually consisted of a single male, one to three females and a few juveniles. This uniformity of structure is undoubtedly a reflection of the uniformity in size and form of the *Acacia* scrub. Very few scrub *Acacia* were large enough to support two or more males, although this was the rule in the much larger *A. tortilis.*

In the few instances in which more than one male inhabited a tree small enough to allow continuous observation, it was evident that males were highly territorial. Females in trees with two or more males generally restricted their foraging areas to coincide approximately with the territories of the males and were rarely seen far

outside this area. No territorial display of females was ever observed, although a female will display to another female in certain instances, such as confrontation over a food source or a cavity for egg deposition.

Confrontations over a favorite food source of limited size, such as a partially opened termite nest, indicated that dominance is largely a matter of size and not sex: a large female for instance will dominate the position at a breach in a termite archway (see above) to the exclusion of the male within whose territory the breach may be.

Kästle (1964:491) reported that his *L. picturatus* were never observed to come to the ground. Observations on *L. p. keniensis* and *L. s. battersbyi* showed that, although both species are highly arboreal, they will come to the ground when attracted by some small movement. If the tail of an individual were accidentally broken off during capture, another gecko in the tree would usually come to the ground for the thrashing tail. Geckos could also be enticed two or three feet away from the base of the tree by scattering wood termites on the ground. During the late afternoon or early evening the geckos would often stay near the ground in the base of the tree and make forays onto the ground after a small, passing invertebrate.

Individuals that were marked artificially (with paint spots) or naturally (lost tail, scars, etc.) were kept under observation for as long as three weeks, and in no case was there emigration from the "home tree." Strong arboreal tendencies and indications of territoriality make it seem likely that most individuals, once they have become established in a tree, rarely leave the tree for the rest of their lives.

Competition: As these two species obviously occupy similar niches, the ways in which competition may be reduced are of interest.

Although it was by no means unusual to find both species occupying the same tree and foraging within inches of each other, the general situation was one species to a tree. In this regard there seemed to be some correlation between the bark color of the *Acacia* inhabited and the occupant species, although no systematic analysis was undertaken to quantify this impression.

In the relatively dense stands of the dark-barked *A. tortilis* along the larger watercourses, *L. p. keniensis*, the darker species, occurred almost to the exclusion of *L. s. battersbyi*. Even in the few *A. tortilis* found along the smaller watercourses, *L. p. keniensis* greatly outnumbered *L. s. battersbyi* which might also be found in the same tree.

On the more open flats, the scrub *A. etbiaca* is the dominant tree. The bark of this species is smooth and ranges in color from light gray to dark reddish brown. In pure stands of the gray-barked trees, *L. s. battersbyi*, the lighter species, was found to the exclusion of *L. p. keniensis*.

Between these two extremes, however, the correlation became less exact and more difficult to establish. Whether this correlation, to the extent that it does exist, is due to habitat selection or random dispersal and natural selection for body color on the given substrate, or both, cannot be decided on the basis of the data at hand.

Whenever the two species were found together in the same tree, it was more frequently the case that a *L. s. battersbyi* would be found in a "*L. p. keniensis* tree" than vice versa. In such situations, the smaller *L. s. battersbyi* tended to occupy the more peripheral branches, while the larger *L. p. keniensis* would be found on the larger central trunks and branches.

Adult *L. s. battersbyi* also inhabited smaller trees and shrubs than adult *L. p. keniensis*.

Both species were often encountered separately on single trees that were quite isolated by stretches (100-200 meters) of lava or quartz pebble sheets. In one instance a male and female *L. p. keniensis* and developing eggs were found on a windswept flat in a dark-barked *Acacia* that some time previously had been stripped of its foliage leaving only the trunks and main branches (Fig. 5). During the afternoon that I worked in this area the tree was hit by three large dust devils.

Beyond these differences, however, there was little indication of any other ecological or behavioral differences between the two species. This is not too disturbing as many of these differences, which are expected on the basis of theory, are hinted at by differences in size and color patterns of the two species. For example, the size difference may be reflected by average differences in the size and kind of prey organisms taken by the two species.

It remains to explain the absence of *L. p. keniensis* from the Kerio River at Lokori (Fig. 3), while it is so common along all other large river courses investigated. It seems to me that this most peculiar local distribution may perhaps be due to the exclusion of *L. p. keniensis* by the somewhat larger *Hemidactylus brooki angulatus*. This widespread nocturnal gecko was very abundant in numerous situations along the Kerio (under the exfoliating bark of *A. tortilis* as well as in earth crevices) but was extremely rare beyond the confines of the Kerio except in the chimneys of the ubiquitous termite nests.

The Kerio has its headwaters far to the south in the high central plateau of Kenya and is undoubtedly the most nearly permanent river in this region of south Turkana. It may be that some environmental factor such as humidity is more nearly optimal for *H. b. angulatus* in south Turkana only along the Kerio and in the termite nests. Under such special conditions in an otherwise hostile environment the species may be able to occur to the exclusion of *L. p. keniensis.*

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TABLE 1

Summary of the size and color pattern differences between *Lygodactylus picturatus keniensis* and *L. somalicus battersbyi*

	picturatus	*somalicus*
Snout-vent length (in mm.) of:		
Hatchling	13-14 (N=10)	11½ (N=3)
Largest adult male	35 (N=53)	27 (N=17)
Largest adult female	34 (N=79)	27 (N=26)
Smallest male with escutcheon scales	26-27 (N=53)	21 (N=18)
Smallest female with oviducal eggs	28 (N=12)	24½ (N=3)
Color pattern of:		
Juvenile	Throat with faint dark chevrons; venter with orange-red mid-ventral stripe.	Throat and venter immaculate.
Adult	Longitudinal light and dark markings on head and shoulders; dark black throat chevrons; venter with yellow mid-ventral stripe.	Head and shoulders uniform — color of dorsum; throat and midventer immaculate.

TABLE 2

Summary of data on sex ratios of total adult complement of *Lygodactylus picturatus keniensis* inhabiting single trees

Number of adult males	*Number of adult females*	*Number of juveniles*
0	6	1 or more
1	8	1
1	3	0
1	1	0
1	3	2
1	2	1 or more
1	3	2
1	2	0
1	2	2
1	2	4 or more
1	3	2
15	21 (+4??)	several
1	2	0
0	2	1
1	1	0
1	2	4 or more
1	0	0
1	1	0
30	64	20 +

Ratio males/females = 1/2.1

Figure 2. Typical view of the open flats in the study area.

Figure 3. The dry bed of the Kerio River near Lokori.

Figure 4. Two pairs of *Lygodactylus picturatus keniensis* eggs in the termite-excavated cavity of a scrub *Acacia*. Part of the dead branch has been broken away to expose the eggs.

Figure 5. Defoliated *Acacia*, on a wind blown flat, harboring a male and female *Lygodactylus picturatus keniensis* and developing eggs.